Waverly Junction Bridge
(Dix's Bridge)
County Road over the Shell Rock River
Waverly vicinity
Bremer County
Iowa

HAER No. IA-38

PHOTOGRAPHS
HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Rocky Mountain Regional Office
Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

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(Dix's Bridge)

Location:	Spanning the Shell Rock River, 4.4 miles southwest of Waverly; SW¼, NW¼, Section 28, Township 91 North, Range 14 West; Jackson Township, Bremer County, Iowa. UTM: 15.539975.4723580
USGS Quadrangle:	Shell Rock, Iowa (7½ Minute Series, 1971)
Date of Construction:	1911
Fabricator:	Waterloo Construction Company, Waterloo IA
Builder:	William T. McRoberts, Waverly IA
Present Owner:	Bremer County, Iowa
Present Use:	roadway bridge (scheduled for replacement in 1992)
Significance:	Fabricated and erected in 1911, the Waverly Junction Bridge (called locally Dix's Bridge) ranks among Iowa's earliest rigid-connected highway trusses. The structure's concrete-filled steel cylinder piers, curved portal knee braces, and threaded-rod lateral bracing are typical features of pinned trusses generally built prior to 1910. The composition of the bridge's web members, their connecting gusset plates and the method of field-bolting, on the other hand, are representative of early rigid-connected trusses. These features distinguish the Waverly Junction Bridge as transitional between the two technologies: a significant and uncommon structure in Iowa's bridge building history.
Report Assembled by:	Carl W. McWilliams Fraserdesign Loveland Colorado

March 1992

The Historic American Engineering Record (HAER) documentation for the Waverly Junction Bridge was conducted by Fraserdesign of Loveland, Colorado, under contract with Bremer County, Iowa. The county has proposed replacement of the structure (Project No. BR-9009(5) - 5F-09) in 1992, and this recordation is intended to mitigate in part the impact on the bridge by this action. Field recording of the Waverly Junction Bridge was undertaken in October 1991. Research for the project was conducted at five locations: the Bremer County Auditor's and Engineer's Offices in Waverly, Iowa, the Waverly and Waterloo Public Libraries and the Iowa Department of Transportation in Ames, Iowa.

After Iowa's admission into the Union in 1846, settlement accelerated throughout the region, and the state was soon divided politically into counties and townships. Bremer County, in northeastern Iowa, was one of 45 such counties founded in 1851.[1] Encompassing lands previously held by the Winnebago tribe, the county had initially shared local government functions with neighboring Buchanan and Fayette counties.[2] Farms sprang up across the area, and local communities were established to provide basic services. Straddling the county's southern boundary, Janesville was established in 1849 as Bremer County's first permanent settlement. Janesville was soon followed by Waverly (the county seat), Frederika, Horton, Tripoli and Denver as the county's principal service centers.[3]

As Janesville and the other communities grew, Bremer County began building a network of graded roads to facilitate travel. Road and bridge building was overseen by the county board of supervisors, which divided the county into districts and elected one-man committees to supervise construction of individual crossings. To bridge the myriad of small streams and ditches, the supervisors usually contracted for rudimentary timber structures. Although inexpensive to erect, these spans were often structurally suspect and required frequent maintenance to prevent their collapse.

For the larger rivers - the Wapsipinicon, Cedar and Shell Rock - the board early on saw the wisdom of building bridges of iron. Bremer County's first all-iron wagon bridge was built across the Cedar River at Waverly in 1871.[4] Other iron or iron/wood combination spans were soon erected, notably the Stockwell and Schlaberg's Ford bridges across the Cedar River (1880), a bridge over the Little Wapsipinicon River in Franklin Township (1882), the Tripoli Bridge over the Big Wapsipinicon (1883) and the Janesville Bridge across the Cedar (1884). One other early iron structure, known as the Henry's Mill Bridge, had been built by 1880.[5]

Between about 1875 and the turn of the century, Bremer County continued to grow, although at a slower pace than it had during the preceding 25 years. During this time, the board of supervisors developed a pattern of contract solicitation and award for county bridge construction. Typically, after receiving a citizens' petition for a bridge at a particular locale, the supervisor overseeing that district would investigate the matter and report to the board. If the report was favorable and funds were available, the board would then advertise for competitive proposals from bridge building firms.

The giant King Iron Bridge and Manufacturing Company of Cleveland was the most prolific bridge contractor for Bremer County during these formative years. King erected a number of the county's iron spans, including the Waverly and the Janesville bridges. Some of King's competitors for county business included the Morse Bridge Company of Youngstown, Ohio, the Dubuque Bridge Company, and the Missouri Valley Bridge and Iron Works of Leavenworth, Kansas. Smaller firms active in the bidding included Raymond and Campbell of Council Bluffs, Minneapolis-based S.M. Hewett and local contractor E.L. Chambers.[6] Shortly after 1900 the supervisors began awarding annual bridge construction contracts to local builders. The county still dealt with the large bridge firms but usually only for fabrication and delivery. The county bridge builder typically built the abutments and piers and erected the steel superstructures. Among the bridges erected using this construction approach was a steel truss across the Shell Rock River near the hamlet of Waverly Junction in 1911.

Located in southwestern Jackson Township, Waverly Junction had been established along the main line of the Chicago, Rock Island and Pacific Railroad. Just after the turn of the century, the railroad extended a spur from the Junction to the city of Waverly, some four miles north. The CRI&P built a railroad depot at Waverly Junction, a post office operated here in 1902-03, and by 1910 a general store and a stockyard had opened.[7] Though never more than a whistle-stop, Waverly Junction's most active period was between 1910 and 1920, when passenger trains made five round trips per day between the Junction and Waverly.

Waverly Junction was just beginning to gain in importance in 1911 when the county supervisors decided to replace the old bridge just east of there with a new steel structure.[8] In February 1911 the board purchased two steel trusses from the Waterloo Construction Company.[9] One span was to be erected across the Cedar River east of Plainfield; the other would be built over the Shell Rock River near Waverly Junction.[10] Using standard steel components rolled at the Cambria mills in Pittsburgh, Waterloo Construction fabricated and delivered the two trusses that spring for a total cost of $5935.00. Waverly contractor W.T. McRoberts, who held the county's annual contract, built the abutments and piers and then erected the superstructure that summer.[11]

The increasing prominence of the Junction as a railroad stop undoubtedly influenced the decision to build the Waverly Junction Bridge.[12] Ironically, though, it was the construction of improved bridges and roads in Bremer County that eventually rendered the railroad spur obsolete. Freight trains used the spur line intermittently into the 1940s, but passenger traffic petered out in the early 1920s, due in large part to the automobile.[13] As rail traffic began to diminish, use of the bridge also declined. Where once people traveled over this crossing frequently to meet visitors at the depot, in later years the structure was regularly used only by residents of the nearby farms.

The Waverly Junction Bridge has changed little since its completion in 1911. The structure today is comprised of a single 150-foot Parker through truss, approached on the west by a series of timber stringer spans. This creates an aggregate structure length of 280 feet. Divided into eight equal panels, the truss has a 16-foot roadway width and a vertical clearance of just under 15 feet between the deck and the struts. The inclined end posts and upper chords consist of two back-to-back channels, covered by a continuous steel plate on top and laced together by steel straps beneath. The verticals are comprised of four angles laced by steel straps. The lower chords and diagonals are similarly configured, each made up of two steel angles with batten plates.

The struts are comprised of four steel angles with X-bracing between. The portal struts are similarly constructed, but also feature additional X-bracing and curved knee braces. The upper and lower lateral braces both consist of round rods with threaded ends bolted to the struts and floor beams, respectively; three lines of steel angles form the guardrails. Steel I-beam floor beams support a floor system comprised of steel stringers and a concrete deck. West of the truss are six timber stringer approach spans, supported by timber pile bent piers. The structure's east abutment and wingwalls are concrete; two concrete-filled steel cylinder piers support the main span's west end. Still faintly visible are the words "W.T. McRoberts Jul 10 1911," scratched in the concrete in the top of the pier at the truss's northwest corner.[14]

The Waverly Junction Bridge incorporated conventional highway truss technology for its time. The structure's web members, their connecting gusset plates and the method of bolting presaged the rigid-connected trusses that were to become the industry standard by the late-1910s. On the other hand, the bridge's concrete-filled steel cylinder piers, curved portal knee braces and threaded-rod lateral bracng were typical of pinned trusses from the early 20th century. The Waverly Junction Bridge is thus distinguished as a transitional structure, representing both pin- and rigid-connected technologies.

The Waverly Junction Bridge was built during the formative period for the Iowa State Highway Commission, just two years prior to the statewide standardization of bridge plans.[15] The need for such standards had been seen as early as 1906 when the Highway Commission reported:

> **The various forms of construction [for bridges] that are made possible by their use have caused each county and township throughout the state to have a heterogeneous combination of structures designed and constructed without system and in many cases without the thought of traffic that they are compelled to carry.[16]**

As the State Highway Commission wrestled with the issue of developing a more homogeneous system of bridge construction in the early 1910s, the individual counties continued to use designs developed either by their own engineers or by independent bridge companies. It was in part from such plans that the state ultimately developed its standardized designs.[17] The standardization of bridge design by the state highway commission in the 1910s essentially marked the end of pin-connected truss erection in Iowa and codified rigid-connected technology. Herein lies the historical significance of the Waverly Junction Bridge. Combined together in this single structure are the last vestiges of one period of construction, and the earliest of the next. The Waverly Junction Bridge today provides insight into this watershed period of highway bridge construction in the 1910s. Exhibiting a high degree of historical integrity, the structure is one of Iowa's best examples of the progression from the pinned to the rigid methods of truss construction.

Endnotes

[1]Leland L. Sage, *A History of Iowa* (Ames: The Iowa State University Press, 1974), page 96.

[2]J.F. Grawe, *History of Bremer County Iowa: A Record of Settlement, Organization, Progress and Achievement*, vol. 1 (Chicago: The S.J. Clarke Publishing Company, 1914), page 90.

[3]H.S. Hoover and William P. Reeves, *Atlas Map of Bremer County, Iowa* (annotated) (Milwaukee: J. Knauber and Company, 1875), page 49.

[4]The Cedar River Bridge built at Waverly in 1871 was a three-span Bowstring through arch-truss, erected by the King Iron Bridge Company. In 1902-03 the structure was dismantled, and two of its spans were re-erected over the Cedar River in Jefferson Township at Green Mill Ford. Though they have been closed for several years, these two

bowstring spans still stand at Green Mill Ford. See Bremer County Board of Supervisors' Record Book A: page 438 (9 June 1869), page 470 (18 October 1869), page 478 (6 January 1870), page 494 (1 June 1870), page 539 (6 January 1871), page 552 (1 April 1871), page 564 (25 June 1871), page 570 (26 June 1871); Book B: page 5 (January 1872), page 621 (10 April 1880); Book E: page 64 (5 May 1902).

[5]Construction of these bridges is discussed in records of the Bremer County Board of Supervisors. See specifically, Book A: page 438 (9 June 1869), page 470 (18 October 1869), page 479 (6 January 1870), page 494 (1 June 1870), page 539 (6 January 1871), page 552 (1 April 1871), page 564 (25 June 1871), page 570 (26 June 1871); Book B: page 5 (January 1872), page 601 (2 January 1880), page 618 (9 April 1880); Book C: page 8 (11 June 1880), page 24 (September 1880), page 28 (2 October 1880), page 35 (11 November 1880), page 59 (January 1881), page 65 (26 February 1881), page 163 (12-14 July 1982), page 166 (6 September 1882), page 219 (6 April 1883), page 225 (2 May 1883), page 241 (8 September 1883), page 298 (7 April 1884), page 301 (9 April 1884), page 303 (11 April 1884), page 307 (24 April 1884), page 311 (7 May 1884), page 335 (8 August 1884), page 339 (2 September 1884).

[6]Bremer County Supervisors' Record Books A, B, C and D (June 1869 - December 1903).

[7]*Bremer County, Iowa* (Dallas: Taylor Publishing Company, 1985), page 17.

[8]An earlier bridge at this location was probably built in 1893 when a new road was established that crossed the Shell Rock River at the same point as the 1911 Waverly Junction Bridge. See Bremer County Road Record C, page 179 (16 November 1893). Unfortunately, no information about the earlier structure's construction history was recorded in records of the Bremer County Board of Supervisors.

[9]Waterloo City Directories reveal that the Waterloo Construction Company was in business between 1910 and 1943. Bridge construction occupied much of the firm's time, but it also fabricated steel for a wide variety of other construction projects. In addition to fabricating the Waverly Junction Bridge, Waterloo Construction most likely was also responsible for the structure's design. It is also possible, however, that the bridge was designed by the Bremer County Engineer, or by an independent engineering consultant.

[10]Bremer County Board of Supervisors' Record Book E: page 351 (6 February 1911). The text of this entry reads:

> **The bids for the construction of one 150-foot span steel bridge across the Shell Rock River east of Waverly Junction and one 140-foot span steel bridge across the Cedar River east of Plainfield were opened and examined. It being found that the bid of the Waterloo Construction Company of $5935.00 was the lowest and best bid, the contract was awarded to this firm.**

[11]W.T. (William) McRoberts held Bremer County's Bridge Construction contract between 1907 and 1912, inclusive. See Bremer County Board of Supervisors' Record Book E: page 241 (8 January 1907), page 320 (3 January 1910), page 347 (5 January 1911), page 368 (4 December 1911), page 395 (3 December 1912). See also, "Agreement and Contract Between William T. McRoberts and the Board of Supervisors of Bremer County," dated 4 January 1910, located in file drawer labeled "Old Bridge Papers" in the Bremer County Courthouse vault.

[12]The structure is also known locally as the "Dix's Bridge", named for the Dix family which has owned land adjacent to the bridge since at least the 1930s.

[13]*Bremer County, Iowa* (Dallas: Taylor Publishing Company, 1985), page 17.

[14]This description is based on two field inspections of the bridge by Clayton Fraser and Carl McWilliams of Fraserdesign, 13 July 1990 and 22 October 1991.

[15]Standard plans for county bridges were developed as directed by the Brockway-Balkema Road Law (known generally as the Brockway Act), passed by Iowa's 35th General Assembly in 1913. In arguing the need for standardization, the Iowa State Highway Commission noted that:

> **There is no other subject... that received such severe criticism as that of the lack of method in the building of the bridges of the state. It was charged that the bridges were not being built as economically as they should be; that in many instances, the plans for the same were too light for the increased traffic of the times; that competition had been eliminated and that the taxpayers were not receiving a square deal."**

(*Iowa State Highway Commission Service Bulletin, May 1914*, page 8.)

[16]*Second Annual Report of the Iowa State Highway Commission Made to the Governor of Iowa for the Year Ending July 1, 1906*, page 25.

[17]It is not known whether the design for the Waverly Junction Bridge formed a prototype for the State Highway Commission. However, the Commission's *T-13* Standard 150-foot x 16-foot design, developed in November 1917, featured a rigid-connected Parker through truss with proportions and details similar to the Bremer County structure.

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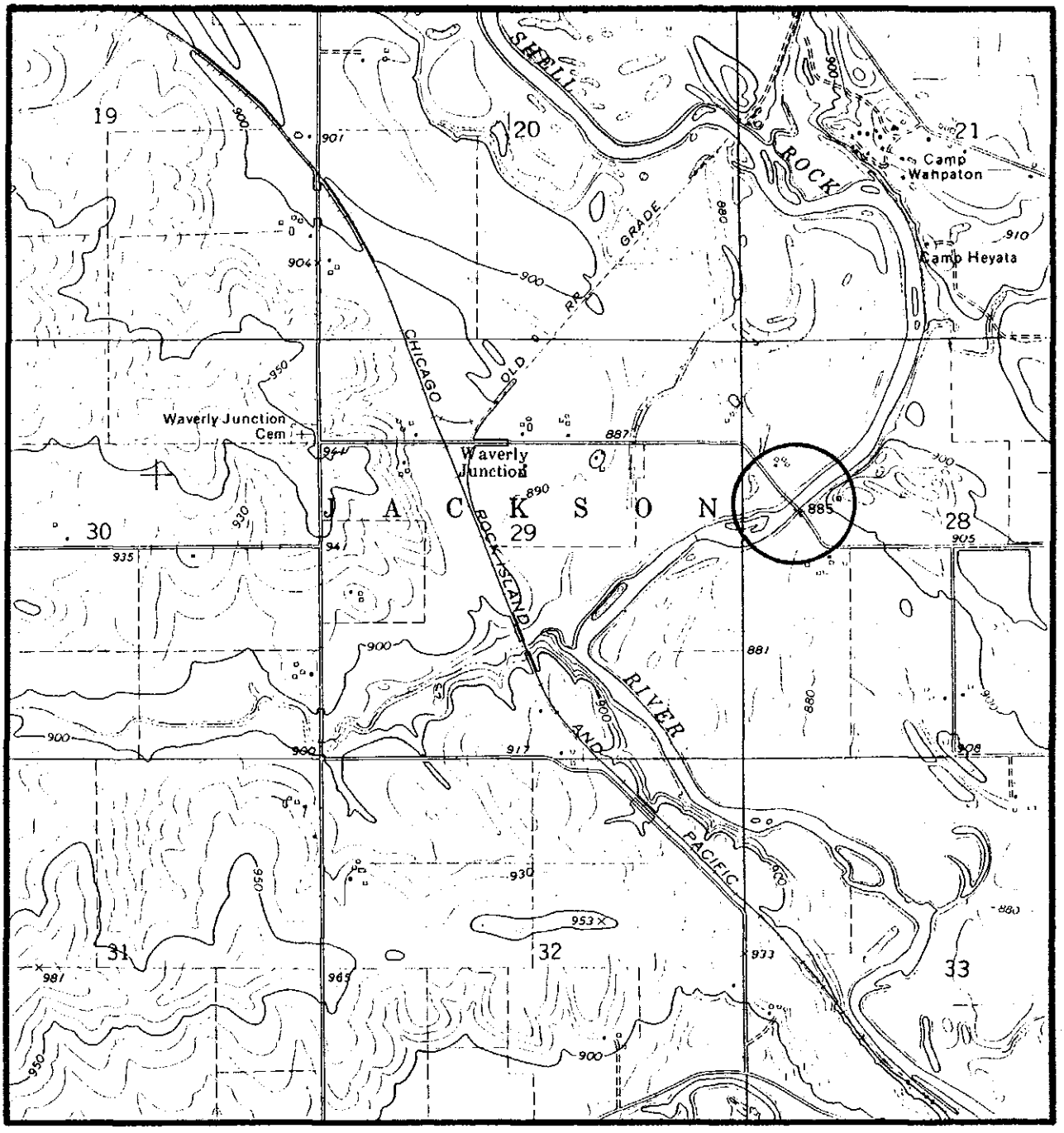

Taken from USGS Shell Rock, Iowa, Quadrangle Map (7½ minute series, 1971).